



Trinity River Authority of Texas
Enriching the Trinity basin as a resource for Texans

LiDAR Acquisition and Flow Assessment for the Middle Trinity River

October 7, 2015

Wastewater Treatment • Water Treatment • Water Storage • Lake Livingston • Recreation



Contributors

TNRIS

Trinity River Authority

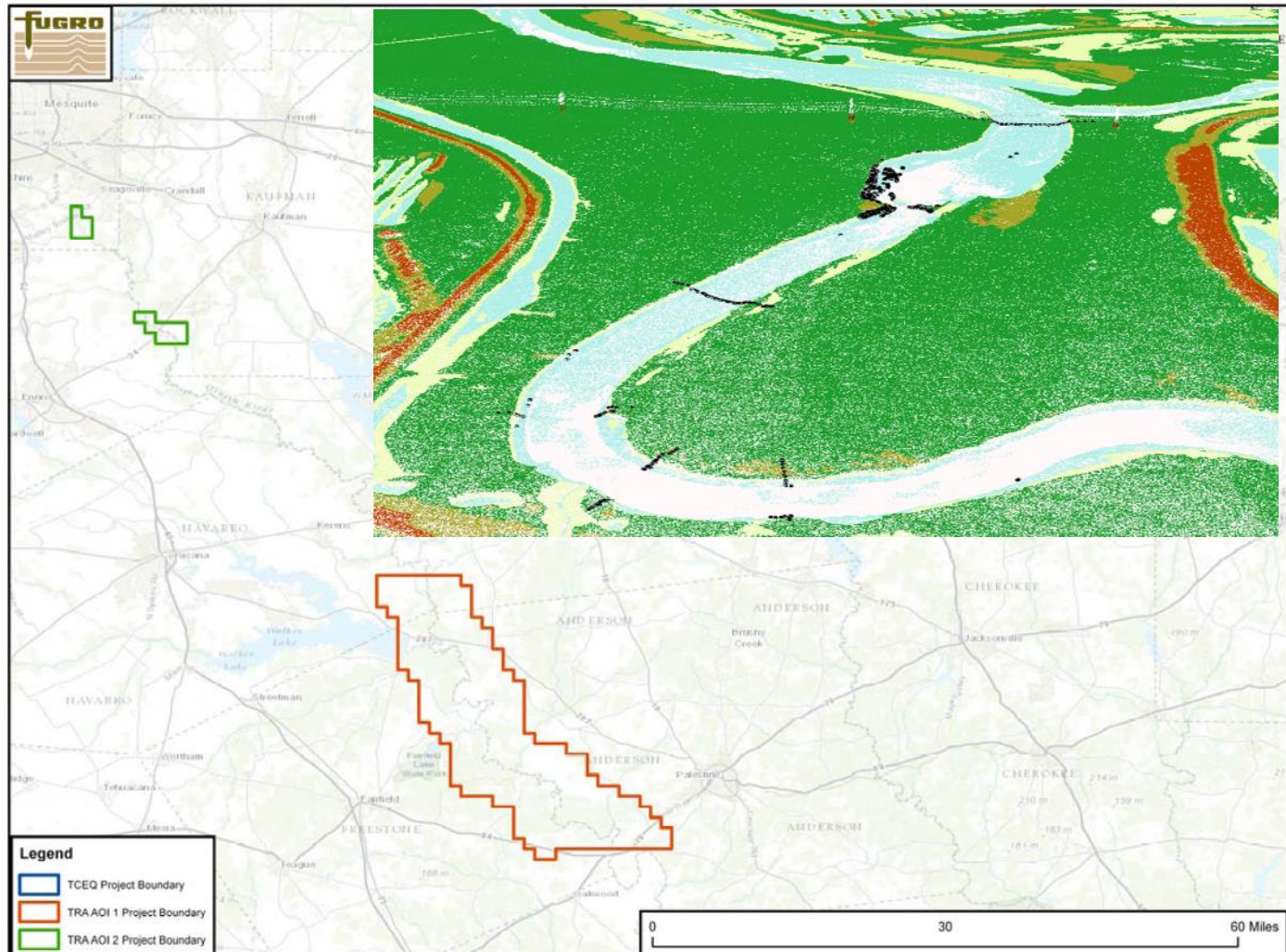
RPS

Aqua Strategies, Inc.

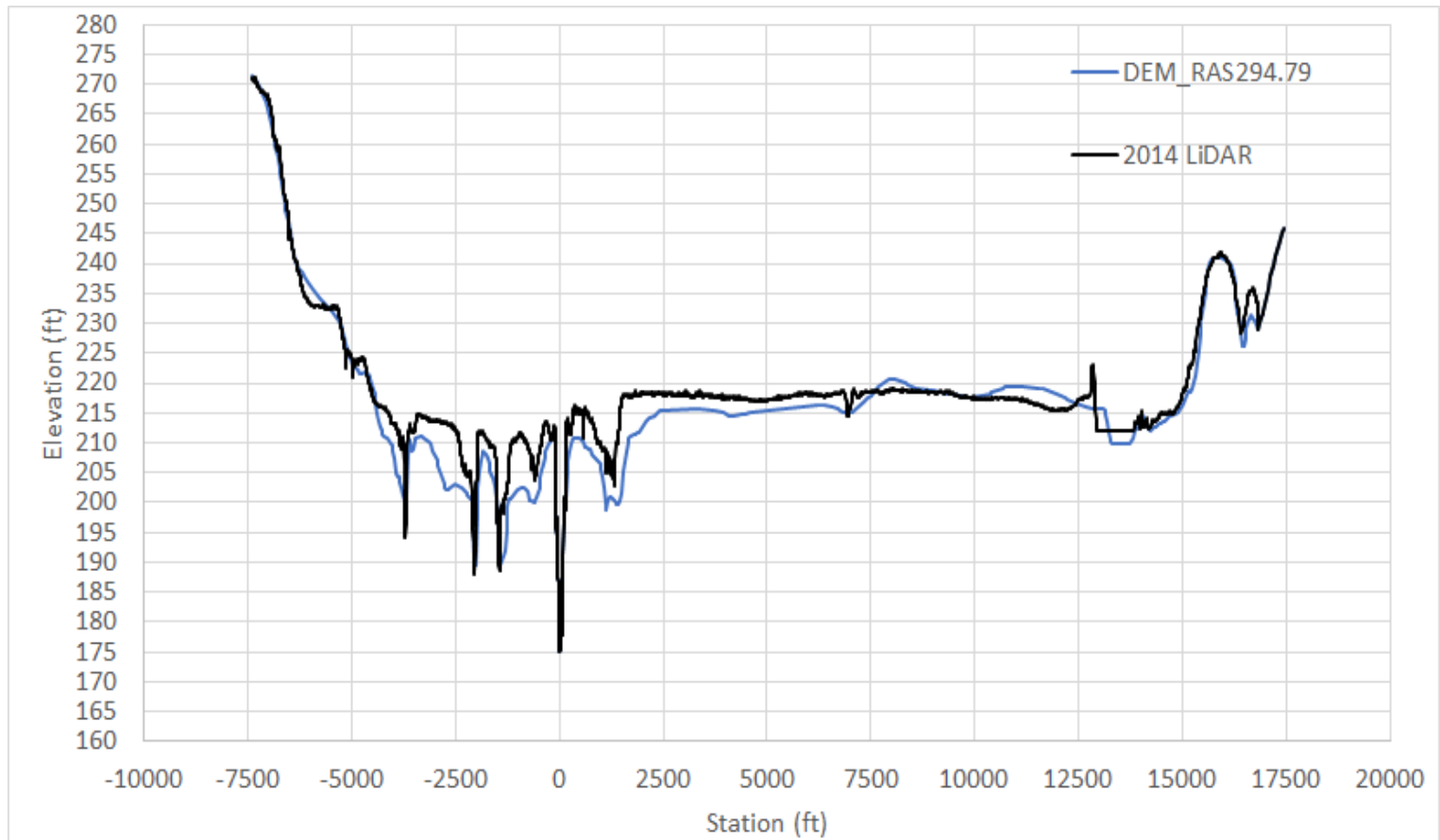
Arroyo Environmental Consultants, Inc.



Part I – Deliver a LiDAR dataset to TNRIS.

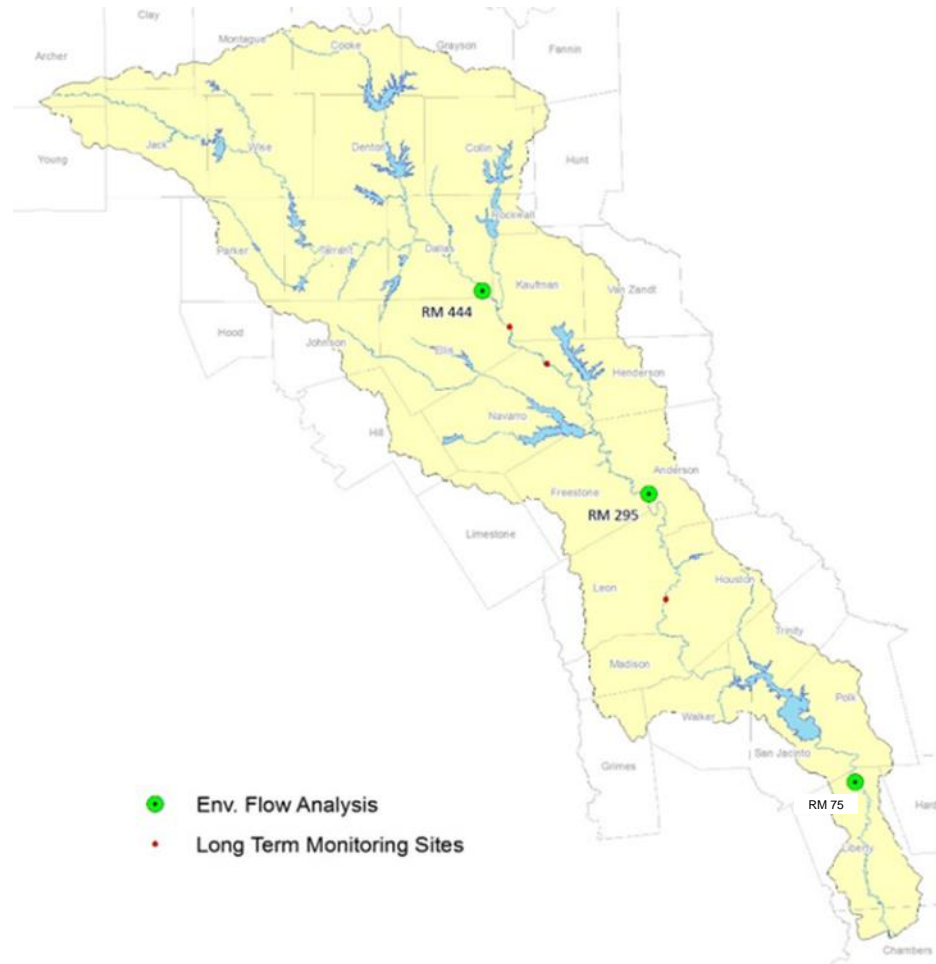


LiDAR Model Refinement (080295)



Scope

Part II - Collect site-specific field data and analyze river characteristics at three SB 3 measurement sites.



Tasks

1. Create a Data Archive Structure
2. Collect Field Data at 3 Sites

Project Site	Representative SB3 Measurement Point Gage
080444	08057000 – Trinity River at Dallas, TX
080295	08065000 – Trinity River near Oakwood, TX
080075	08066500 – Trinity River at Romayor, TX

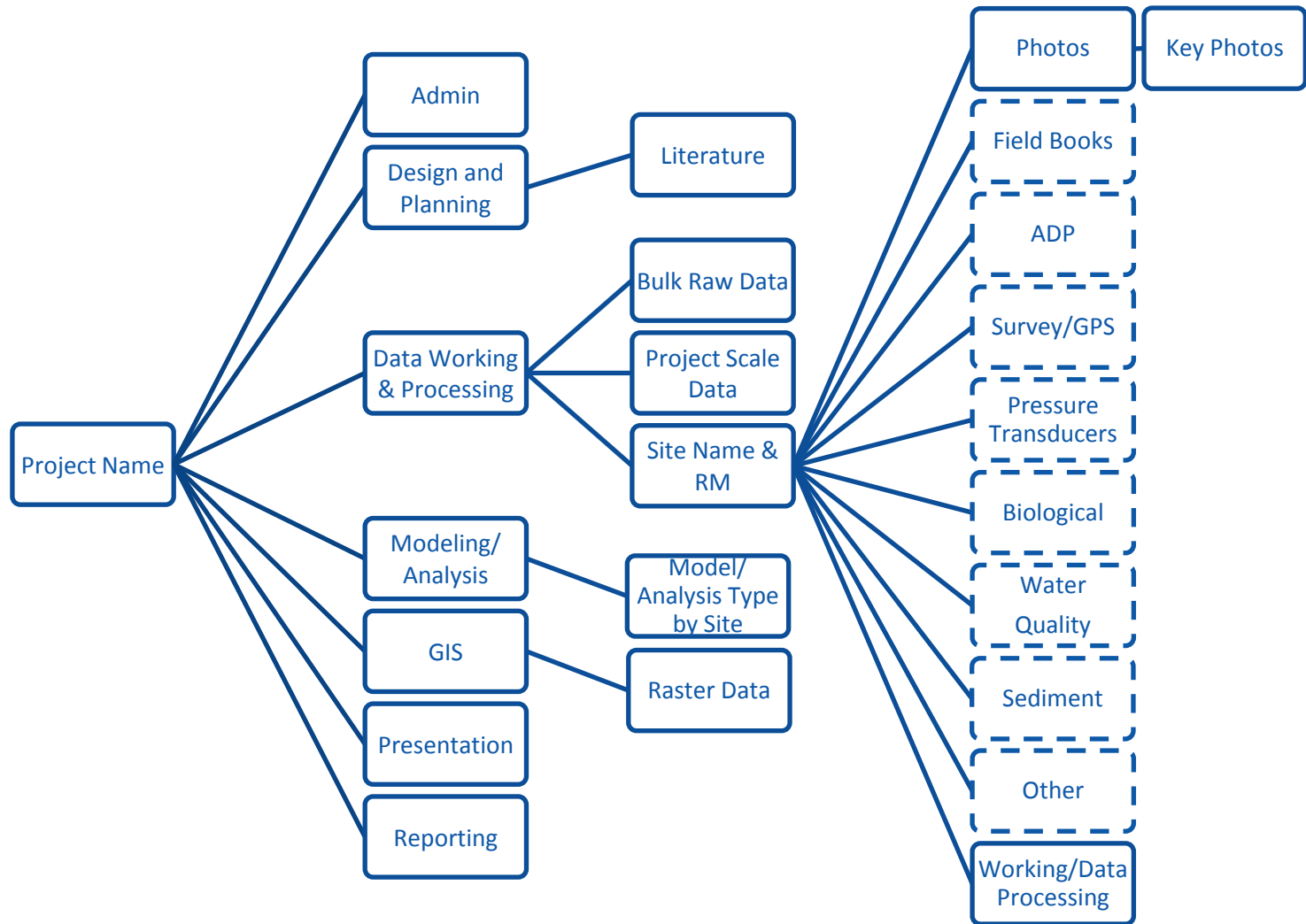
3. Data Processing and Modeling
4. Data Analysis and Reporting

Task 1 – Data Archive Structure

- Why was it needed
 - 10 + Data Types – survey, flow, sediment, photographs, etc.
 - Data processing – Cross-section data can be a combination of topography, bathymetry, RTK GPS etc.
 - Large volumes of data in several stages (raw, QAd, processed, final etc.)
 - Cohesive archiving structure for future retrieval
- Several iterations
 - Balance: Data Management vs. Need



Task 1 – Data Archive Structure



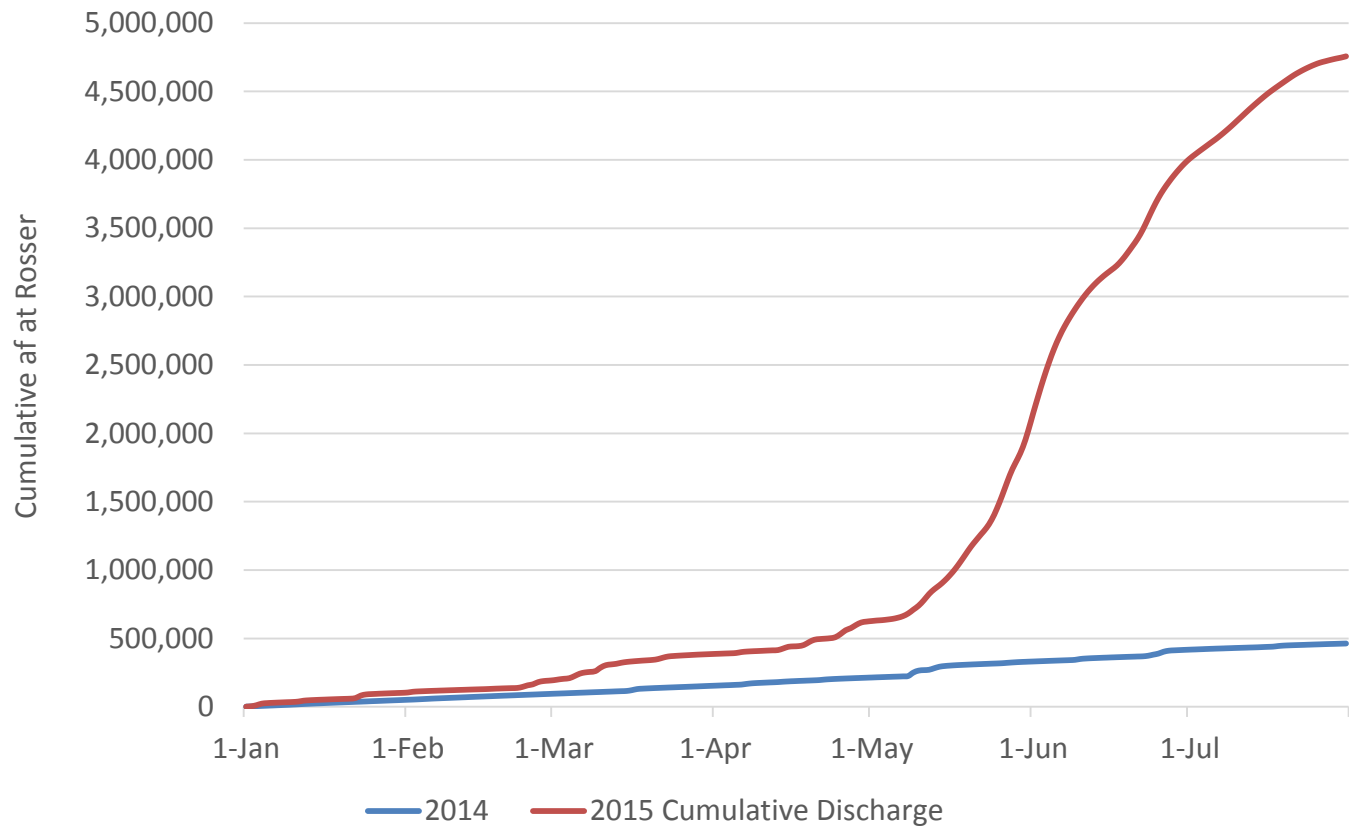
Naming Convention Example - 080444_20150101_PT_v3.xlsx

Task 2 – Data Collection

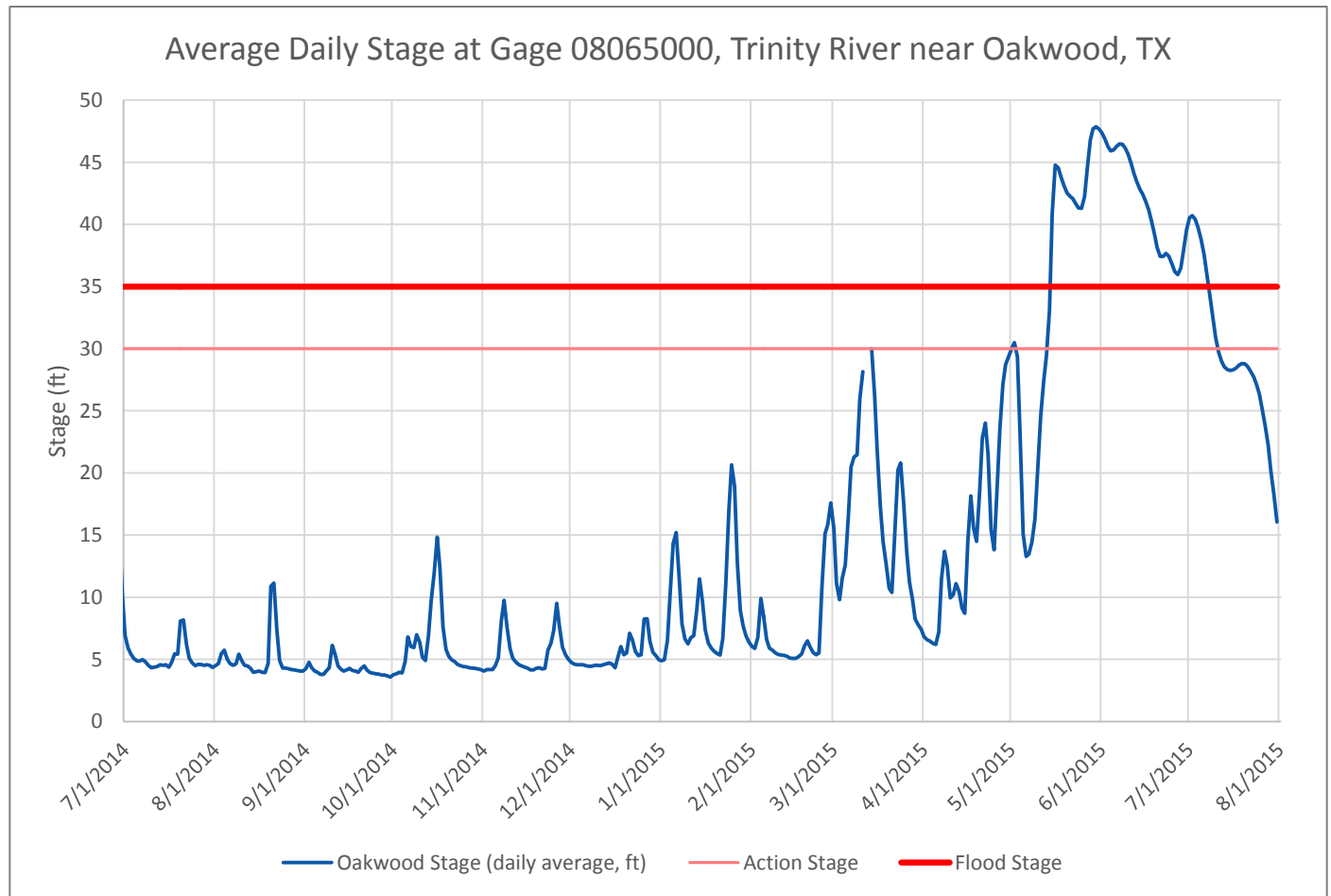


Flows presented some challenges.

Discharge at Rosser, 2014 vs. 2015



Stage at Oakwood



Data Collection

- Field Events

- 080444

- 1 Site install/survey
 - 2 Pulse events
 - 2 Flood events

- 080295

- 1 Site install/survey
 - 1 Pulse events
 - 1 Flood recon event
 - 2 Flood events

- 080075

- 1 Site install @ high flow
 - 1 Site survey
 - 2 Pulse events
 - 1 Flood event

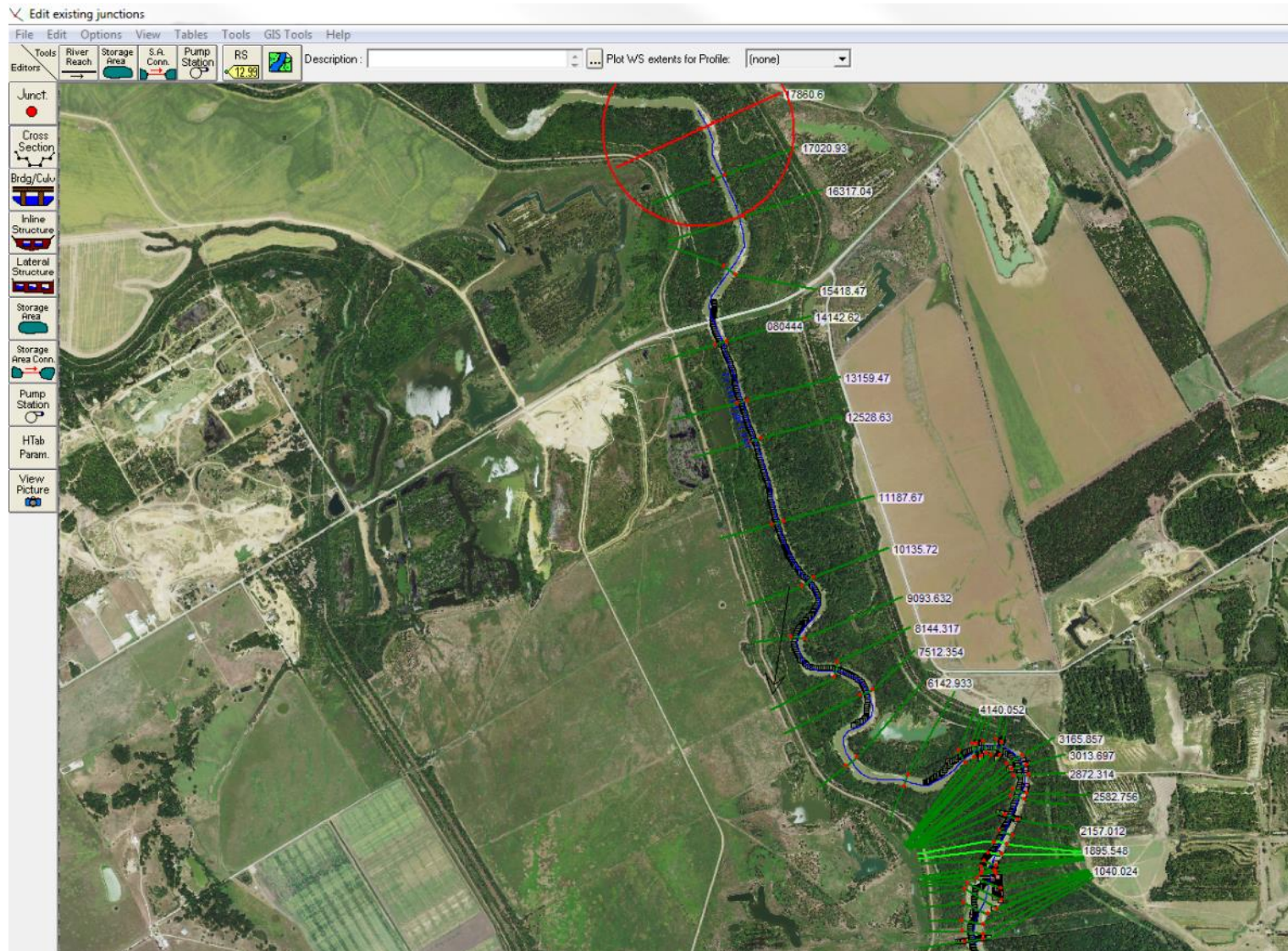


Data Collection



Results - 080444

Surrogate for USGS Gage - 08057000 – Trinity River at Dallas, TX



080444 – Relic USACE Lock Monitoring Ongoing Channel Changes



080444 – Relic USACE Lock

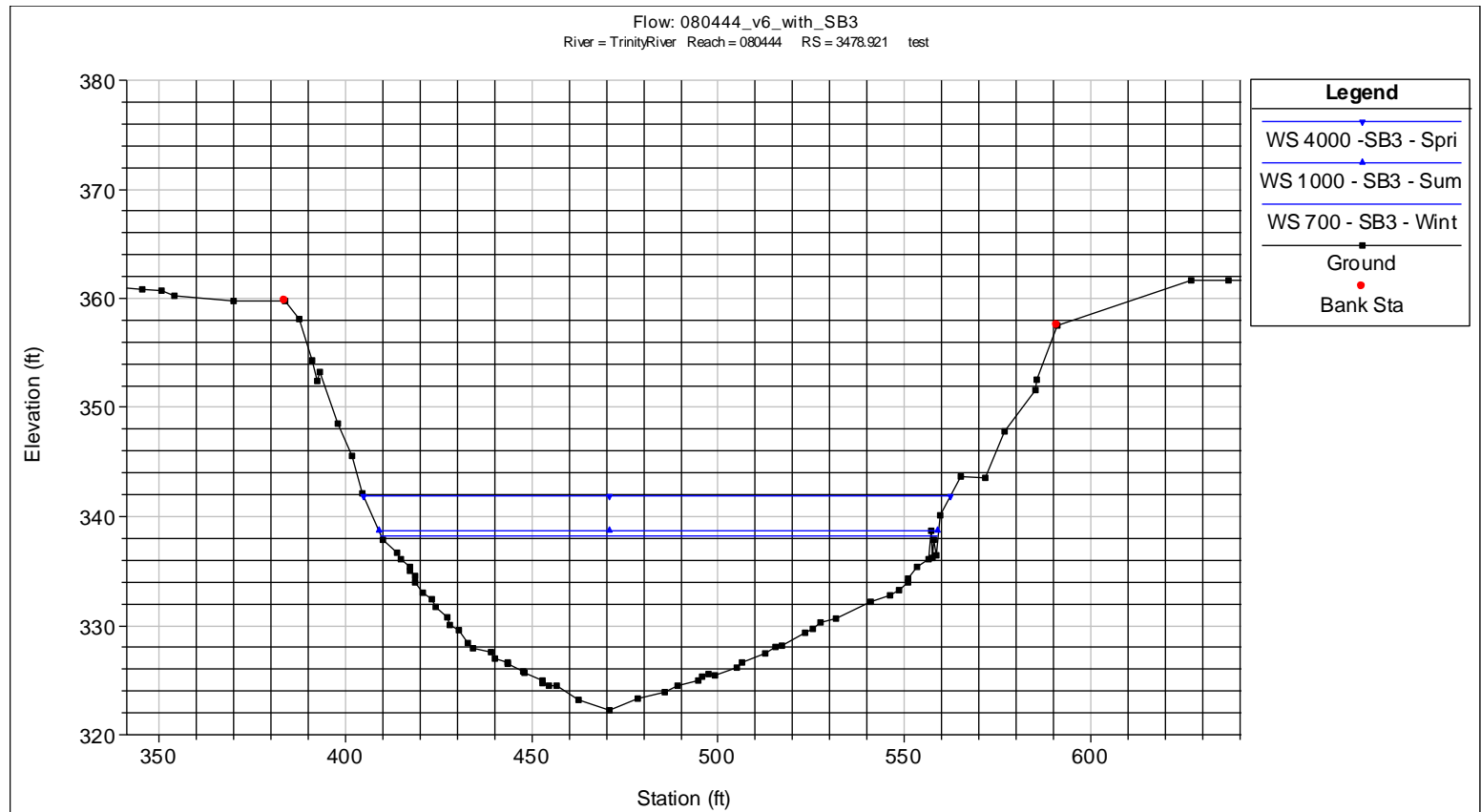


080444 – Relic USACE Lock



080444 Cross-section 2

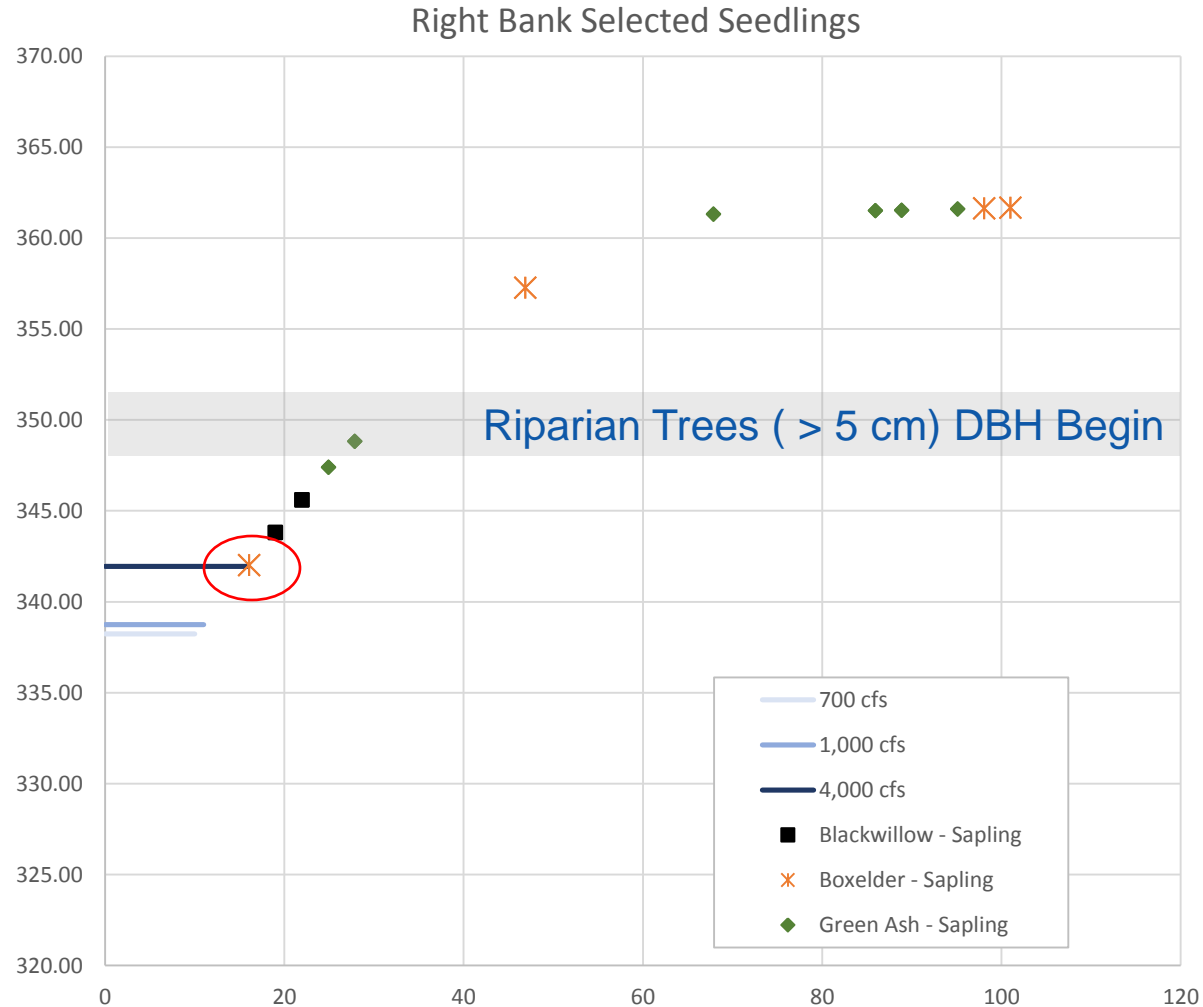
HEC-RAS Results at SB3 Pulse Flows



3.71' difference between 4,000 cfs and 700 cfs.

080444 Cross-section 2

Riparian Results* at SB3 Pulse Flows



*Data processed from a previous 2013 study.

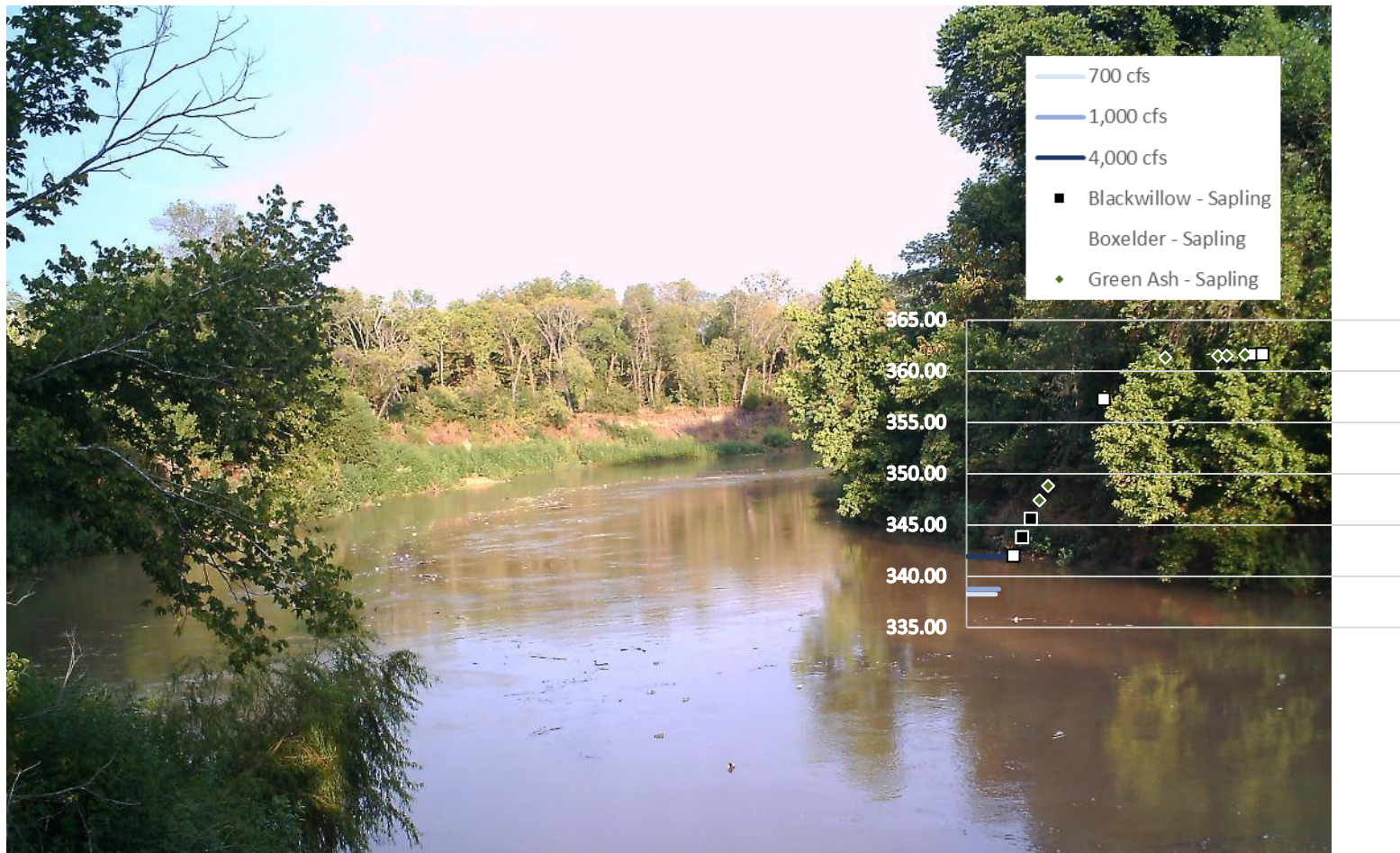
080444 Cross-section 2 – Riparian

~ 700 cfs



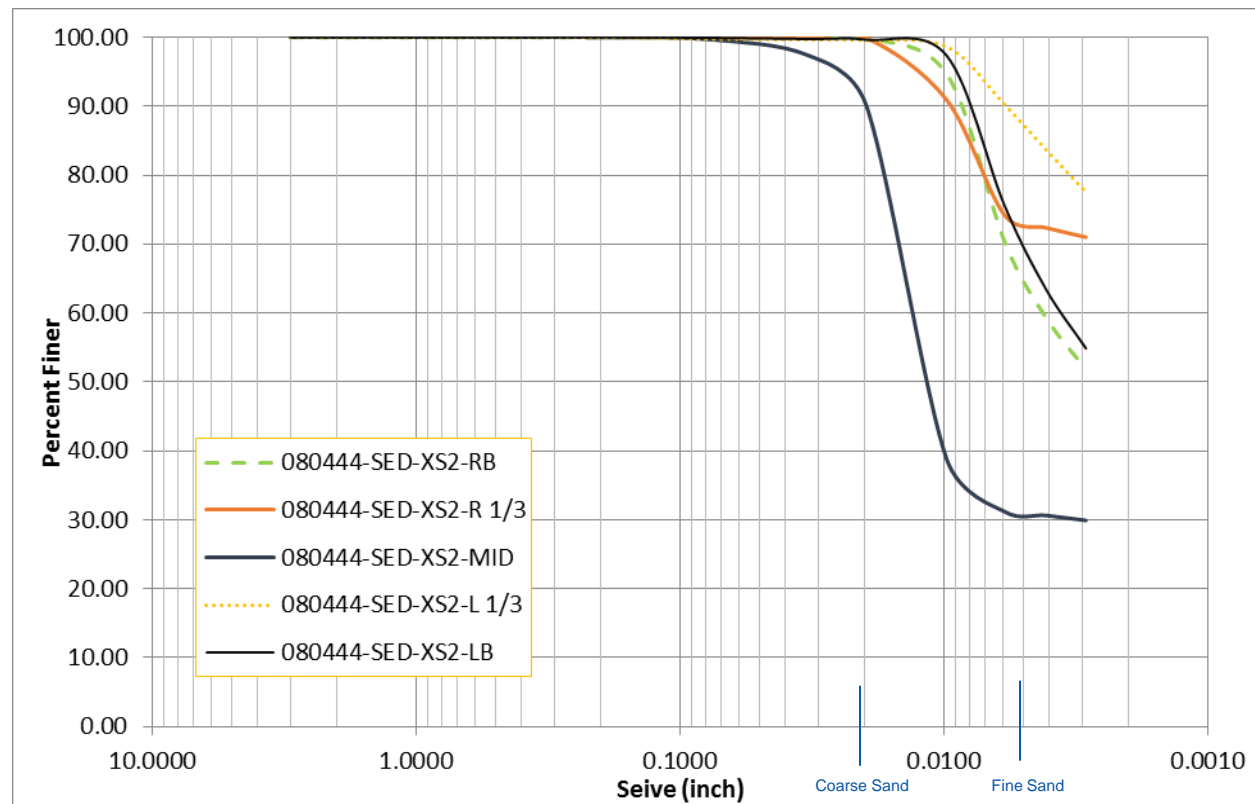
080444 Cross-section 2 – Riparian

~ 5,000 cfs



080444 - Sediment Transport Capacity

- Sand is transported at all XSs above 526 cfs, except at XS2 where it is depositing (pool).
- Field collected sediment data agrees



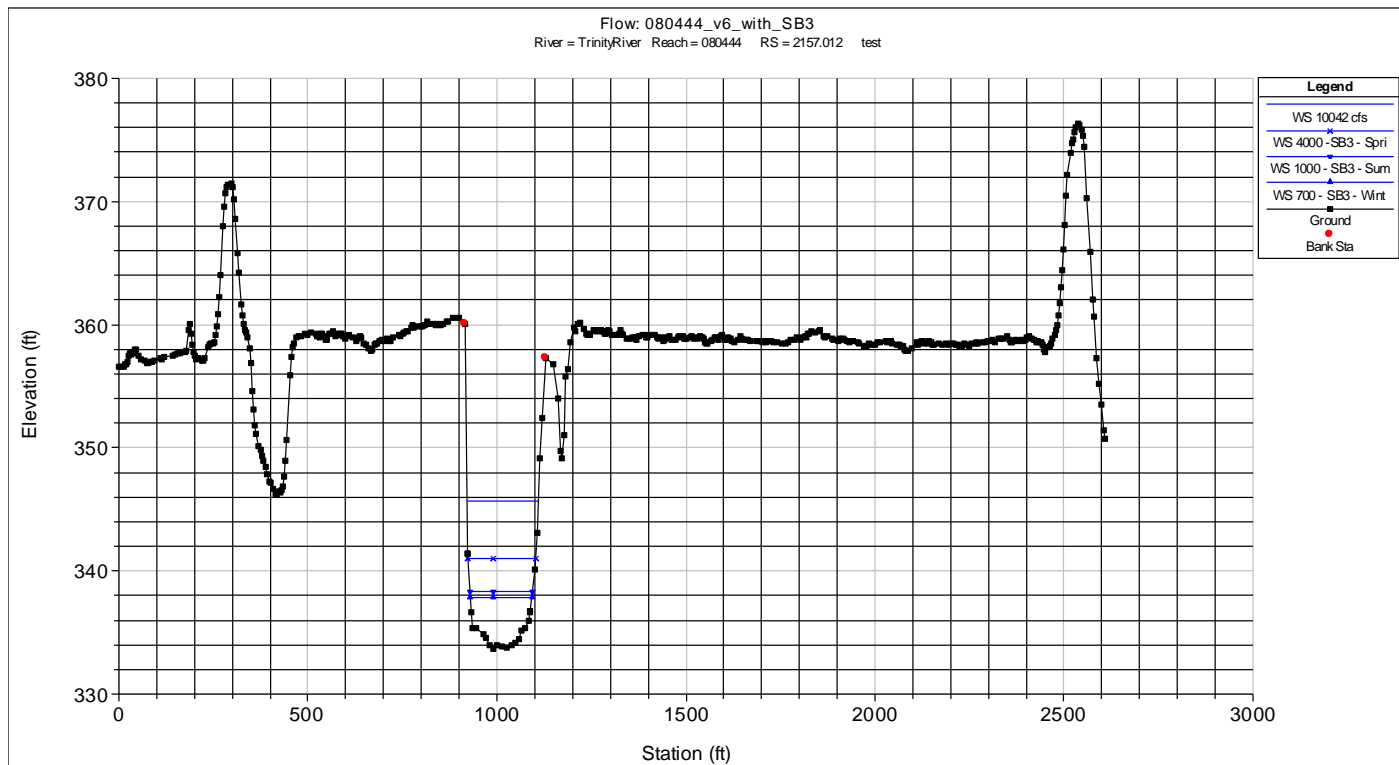
080444 - Sediment

- 080444 Cross-section 4, riffle
- Sediment appears to be moving through the system at the SB3 pulse flows.

SB3 Flows	Sediment Size Mobilized at 080444_XS_4 (Riffle)
700 cfs (Winter)	Medium Gravel
1,000 cfs (Summer/Spring)	Medium Gravel
4,000 cfs (Fall)	Coarse Gravel

080444 - Overbanking

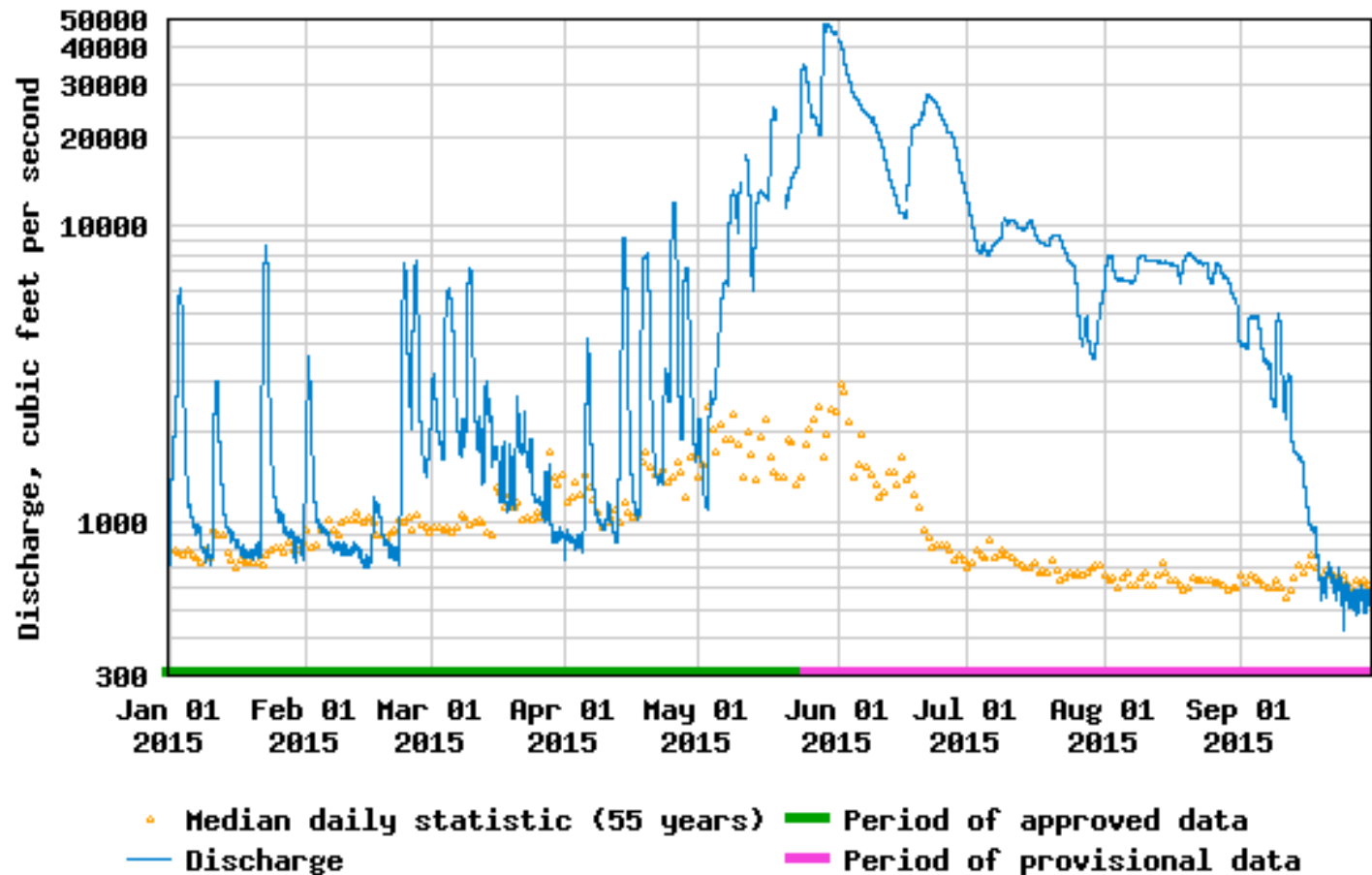
- No model data in the overbank
- PT retrieved after pulse of $\sim 6,500$ cfs
- Site recon at 10,042 cfs – 15' from TOB at riffle



080444 - Overbanking



USGS 08057410 Trinity Rv bl Dallas, TX



080444 – Overbanking ~ 35,000 cfs



080444 – Overbanking ~ 490 cfs



080444 - Overbanking

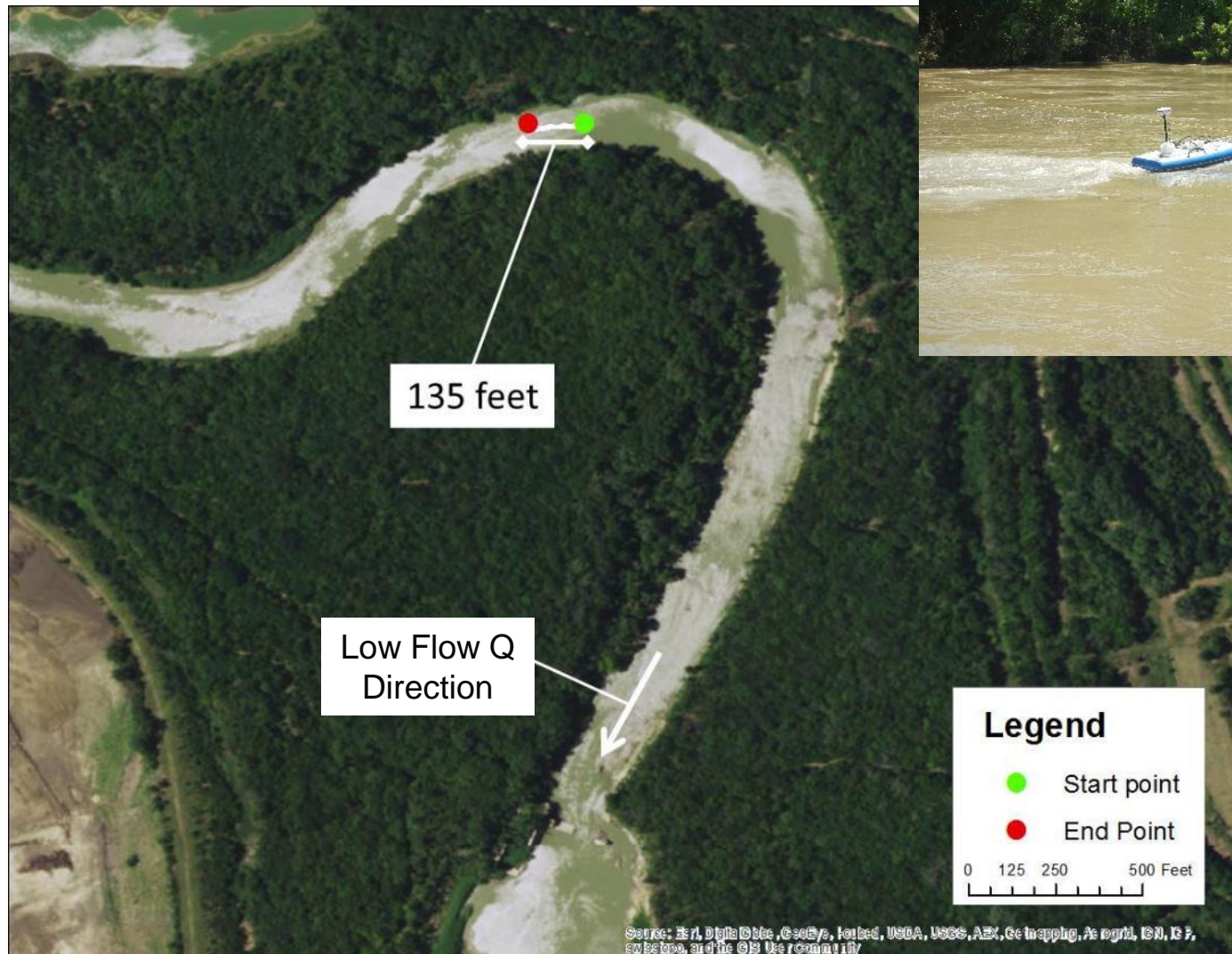


080444 – Overbank Deposition on BM



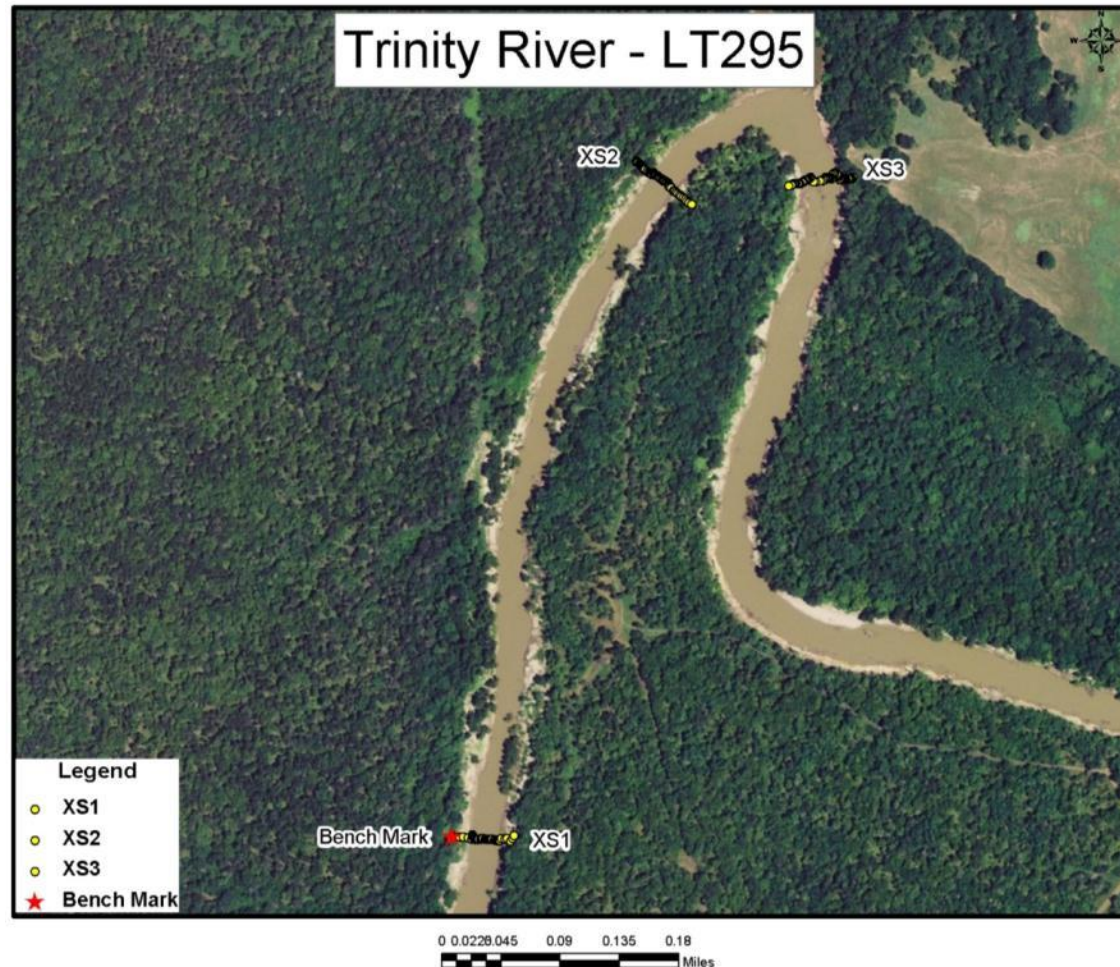
080444 – Moving Bed Measurement

~ 35,000 cfs

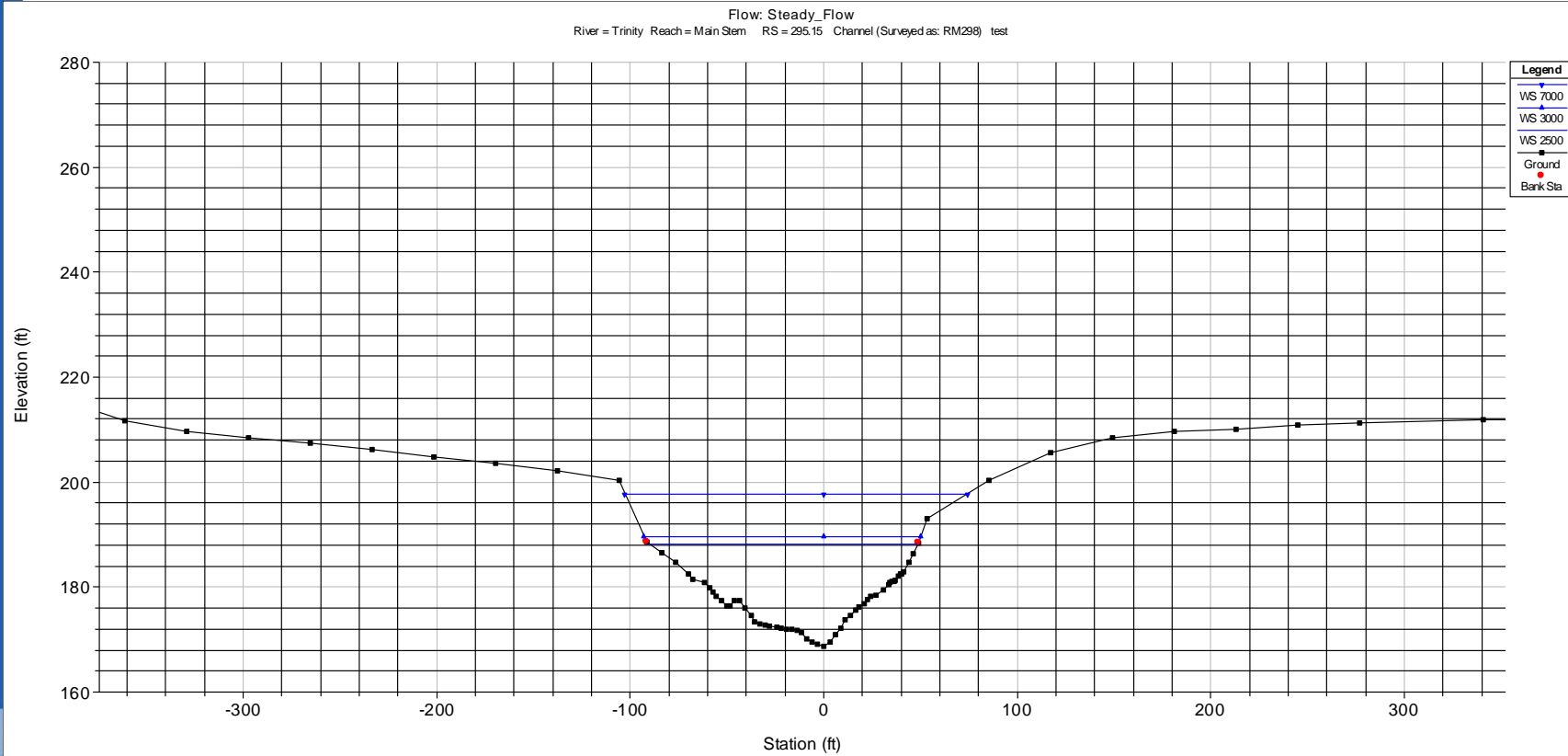


Site - 080295

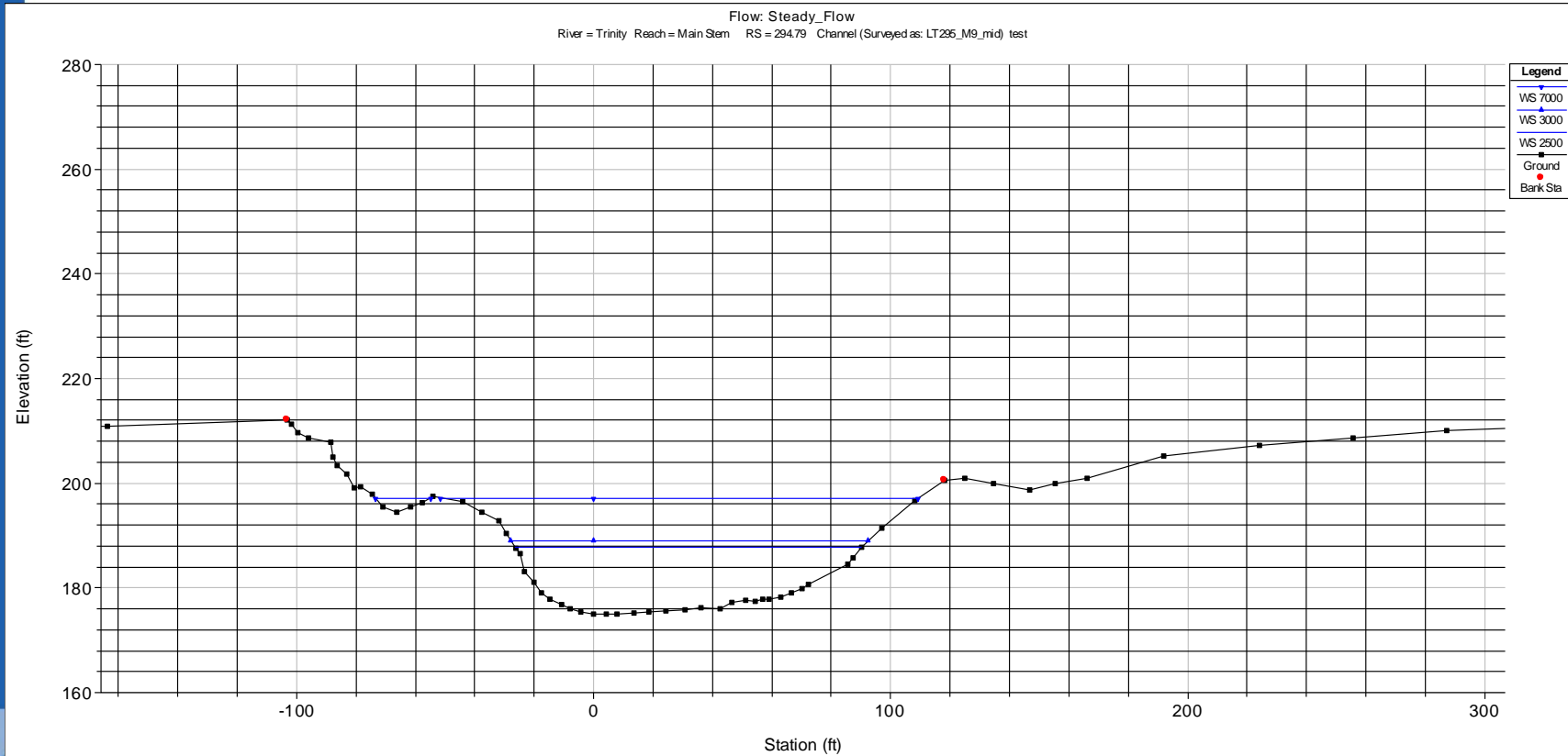
USGS Gage - 08065000 – Trinity River near Oakwood, TX



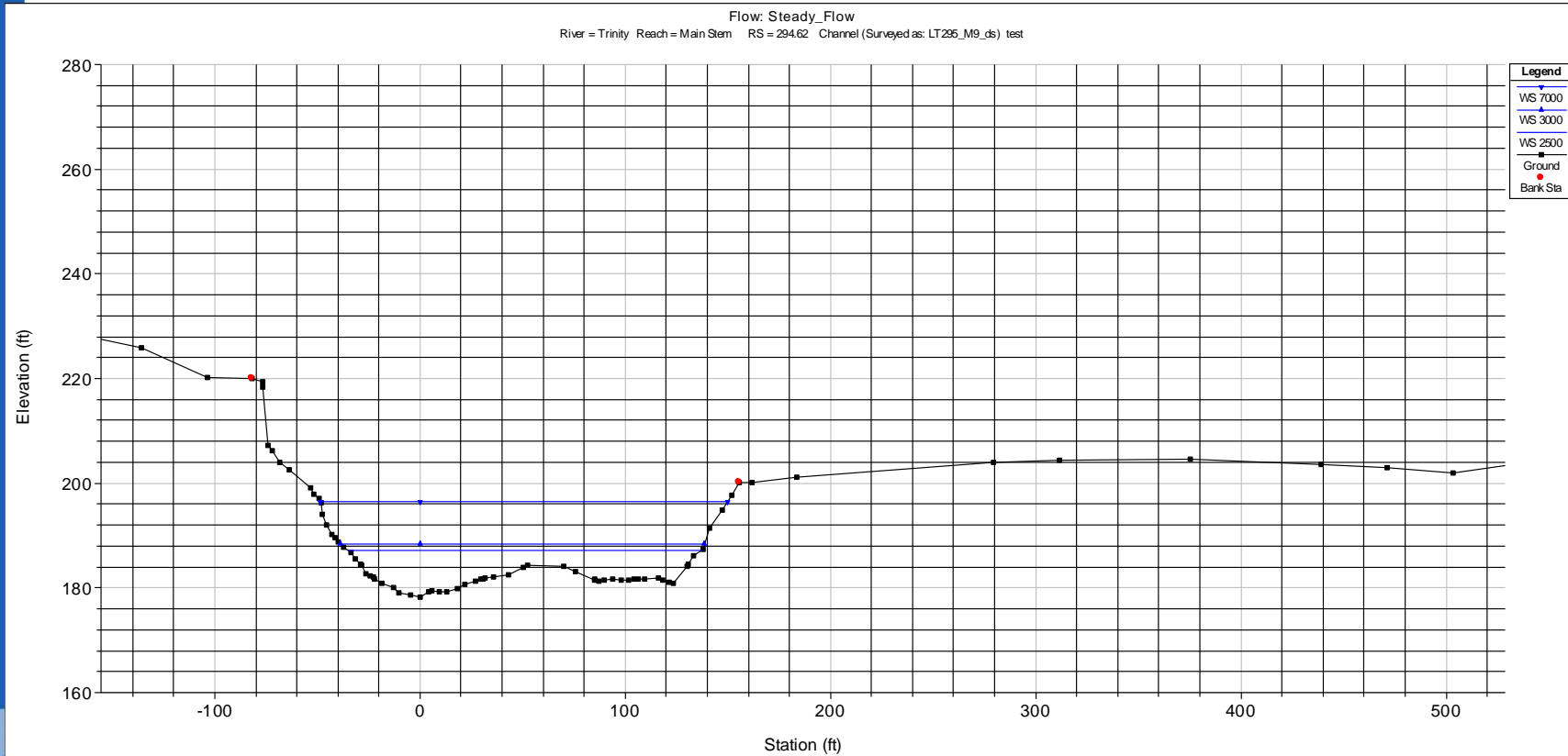
080295 – Cross-section 1



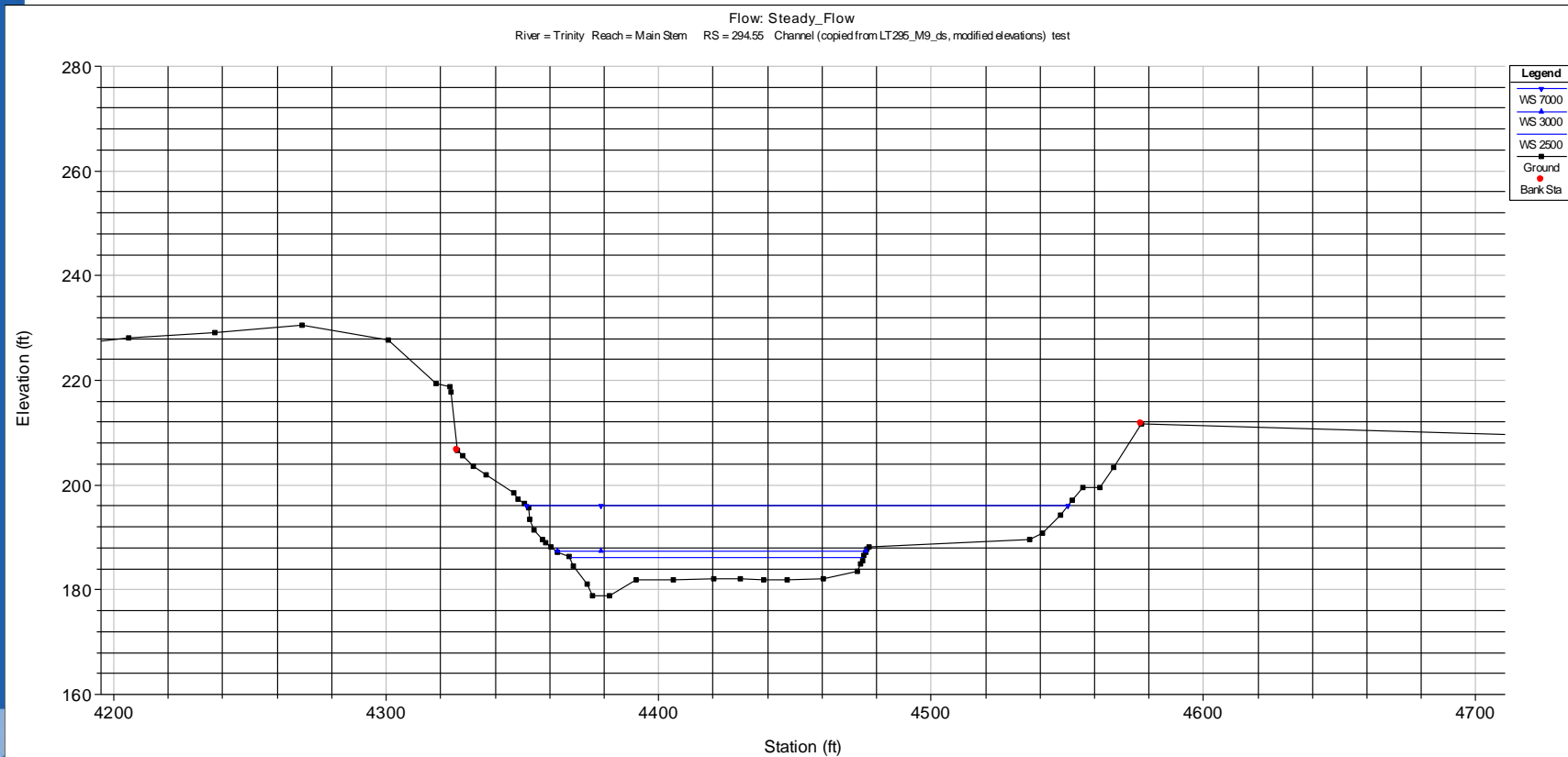
080295 – Cross-section 2



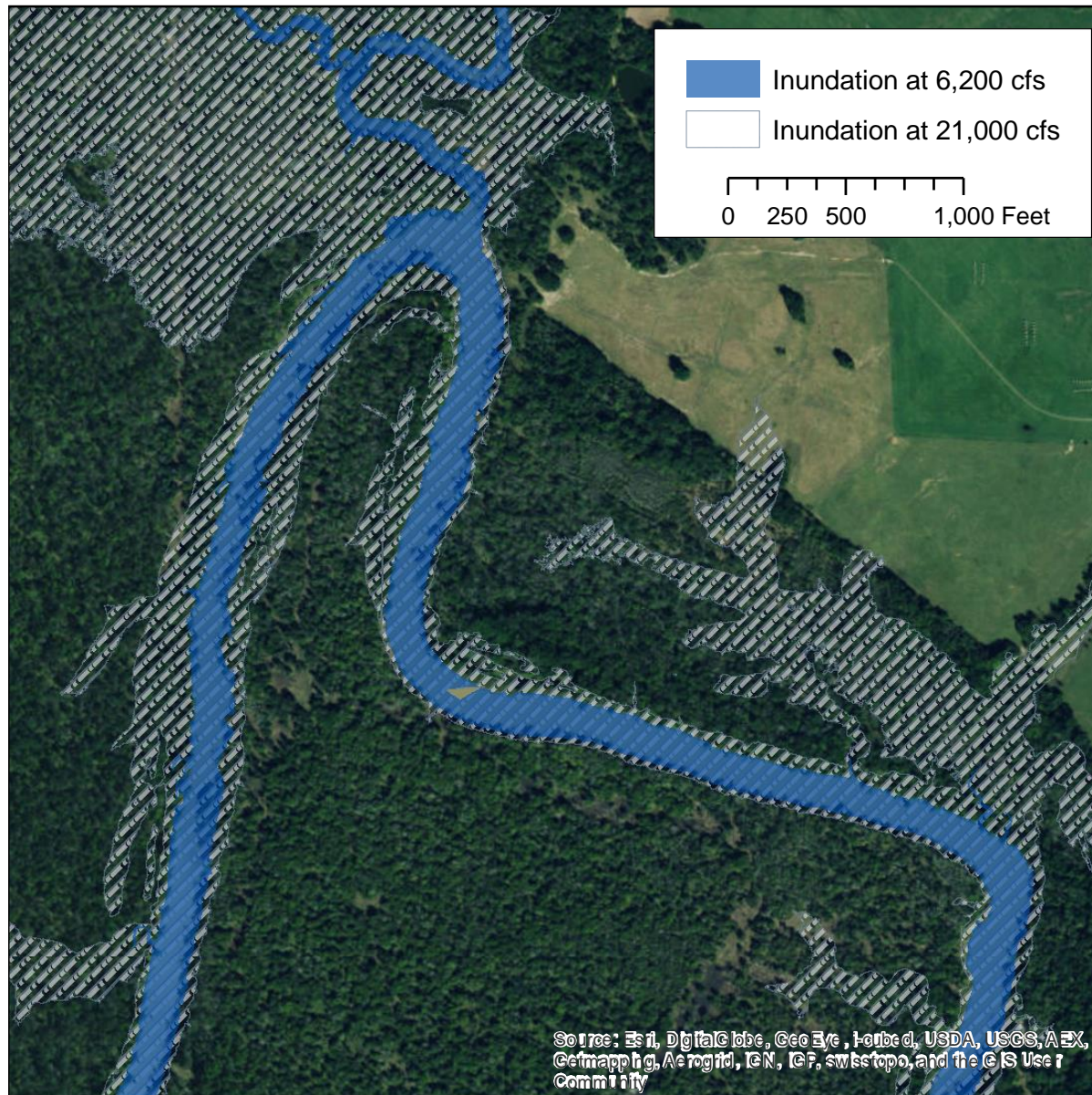
080295 – Cross-section 3



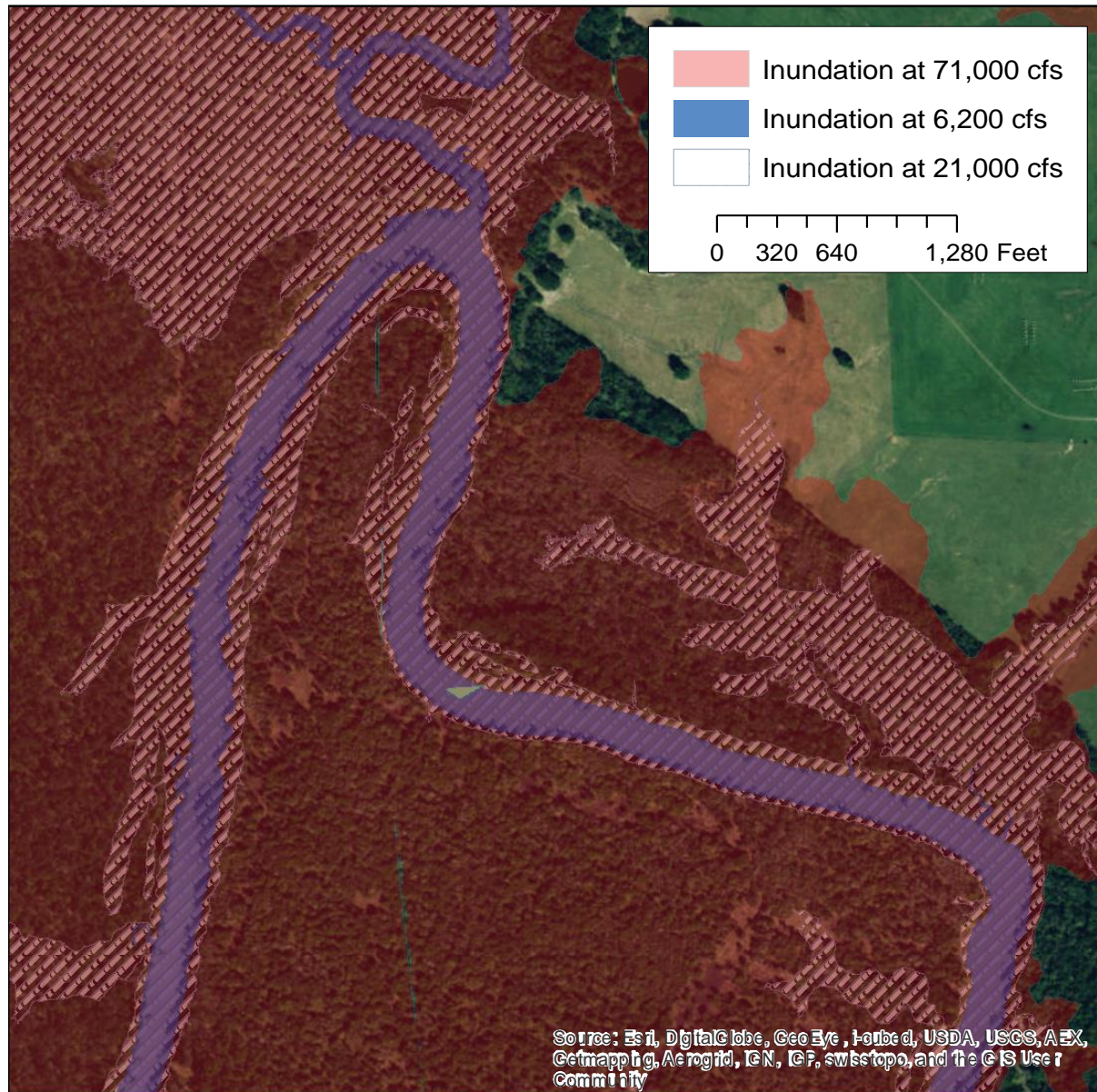
080295 – Cross-section 4



080295 – Inundation



080295 – Inundation



080295 - Sediment

SB3 Flows	Sediment Size Mobilized at 080295_XS_3 (Riffle)
3,000 cfs (Winter)	Small cobble & erosion of compacted clay
7,000 cfs (Spring)	Large cobble & erosion of compacted clay
2,500 cfs (Summer/Fall)	Small cobble & erosion of compacted clay



080295 – Riparian ~2,500 cfs



COVERT

10.18.2014 17:22:24 25 024°C 075°F 9 Remote1

080295 – Riparian ~3,000 cfs



COVERT

10.14.2014 11:01:10 21 014°C 057°F 9 Remote1

080295 – Riparian ~7,000 cfs



COVERT

01.24.2015 13:35:19 05 007°C 045°F 6 Remote1

080295 – Riparian ~11,000 cfs



COVERT

01.25.2015 15:14:47 06 014°C 057°F 06 Remote1

080295 – Riparian ~2,500 cfs



COVERT

080295 – Game Camera Re-deployment





COVERT

05.27.2015 16:37:57

10

023°C 073°F





COVERT

05.27.2015 17:38:40

10

025°C 077°F



9



COVERT

05.27.2015 19:09:44

○10

022°C 072°F



9



COVERT

05.28.2015 06:30:52

11

017°C 063°F 9

~80,000 cfs at Oakwood Gage

080295 – Game Camera Re-deployment



080295 - Overbanking



~7,000 cfs

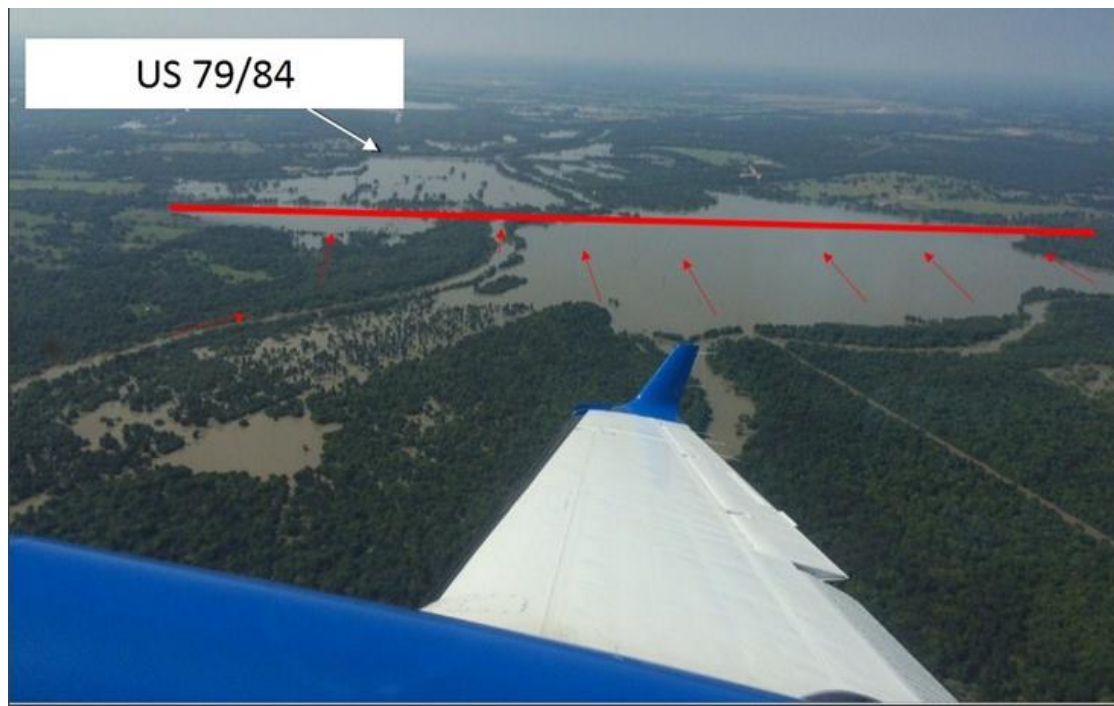


~60,000 cfs

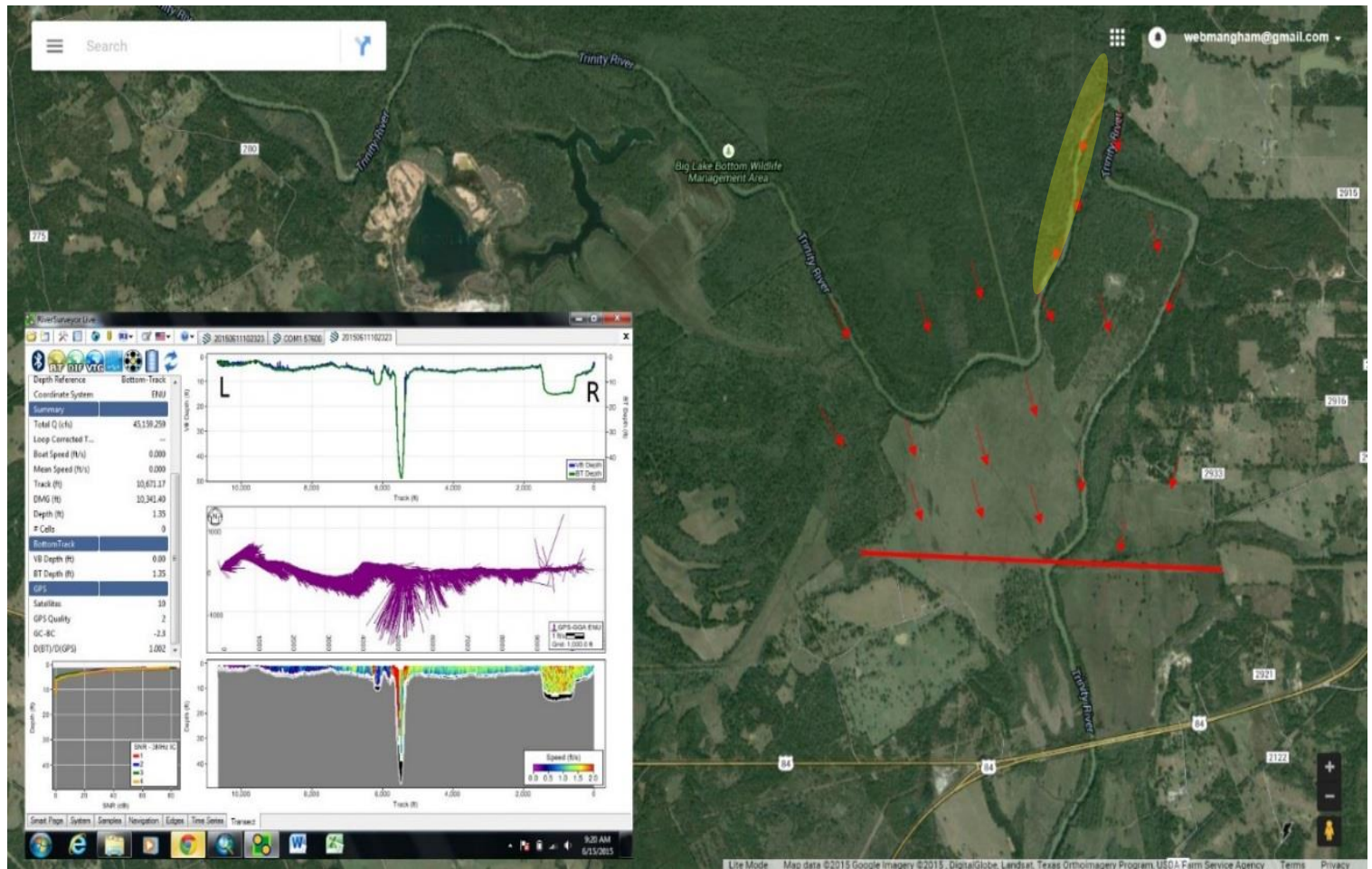
US 79/84



US 79/84

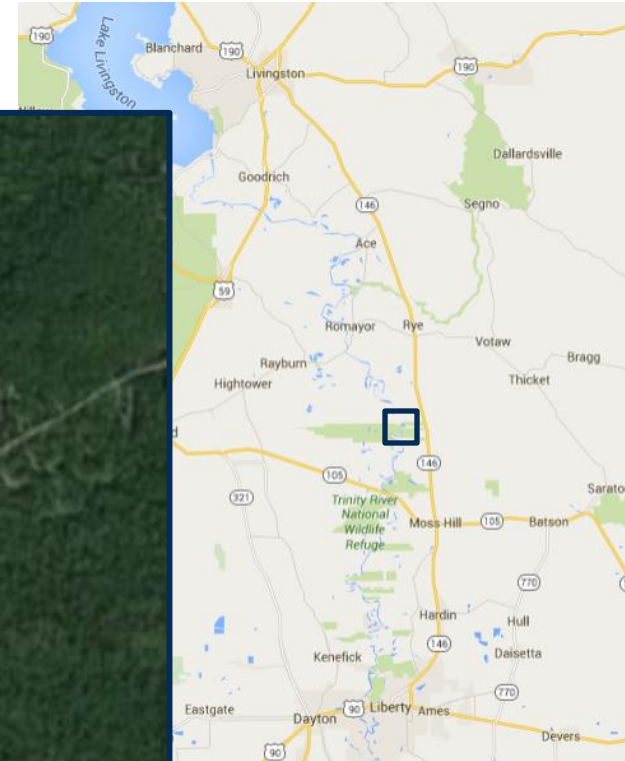


080295 - Overbanking

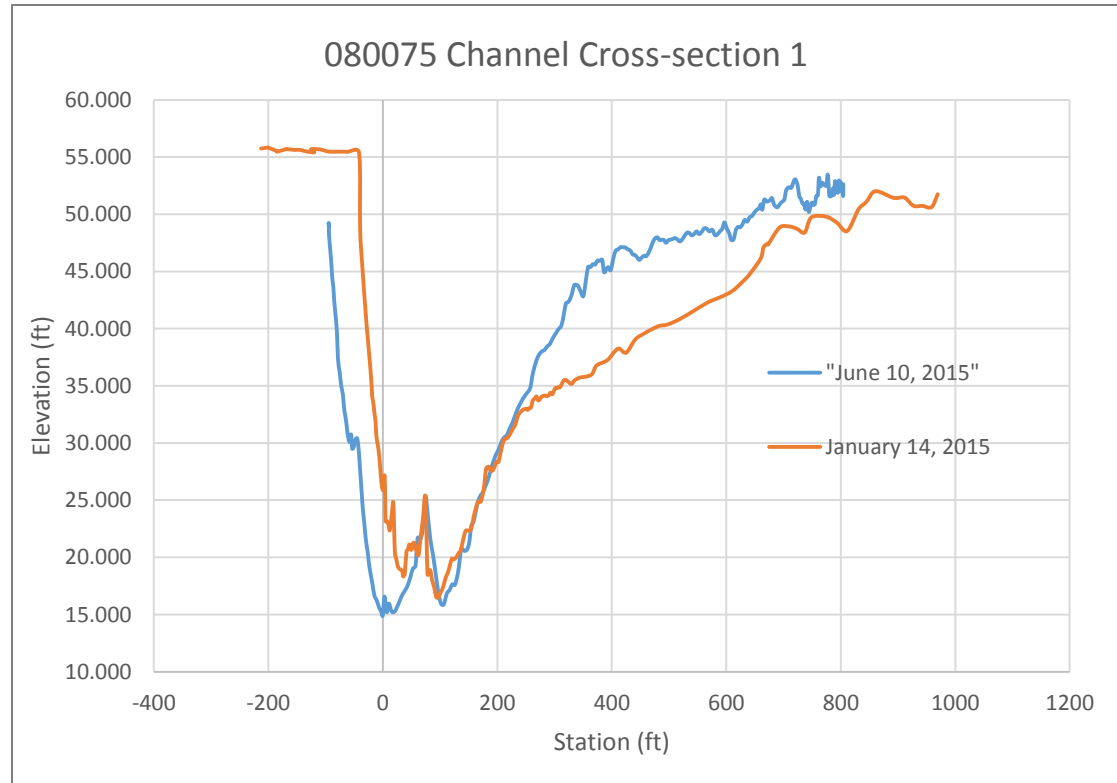


080075

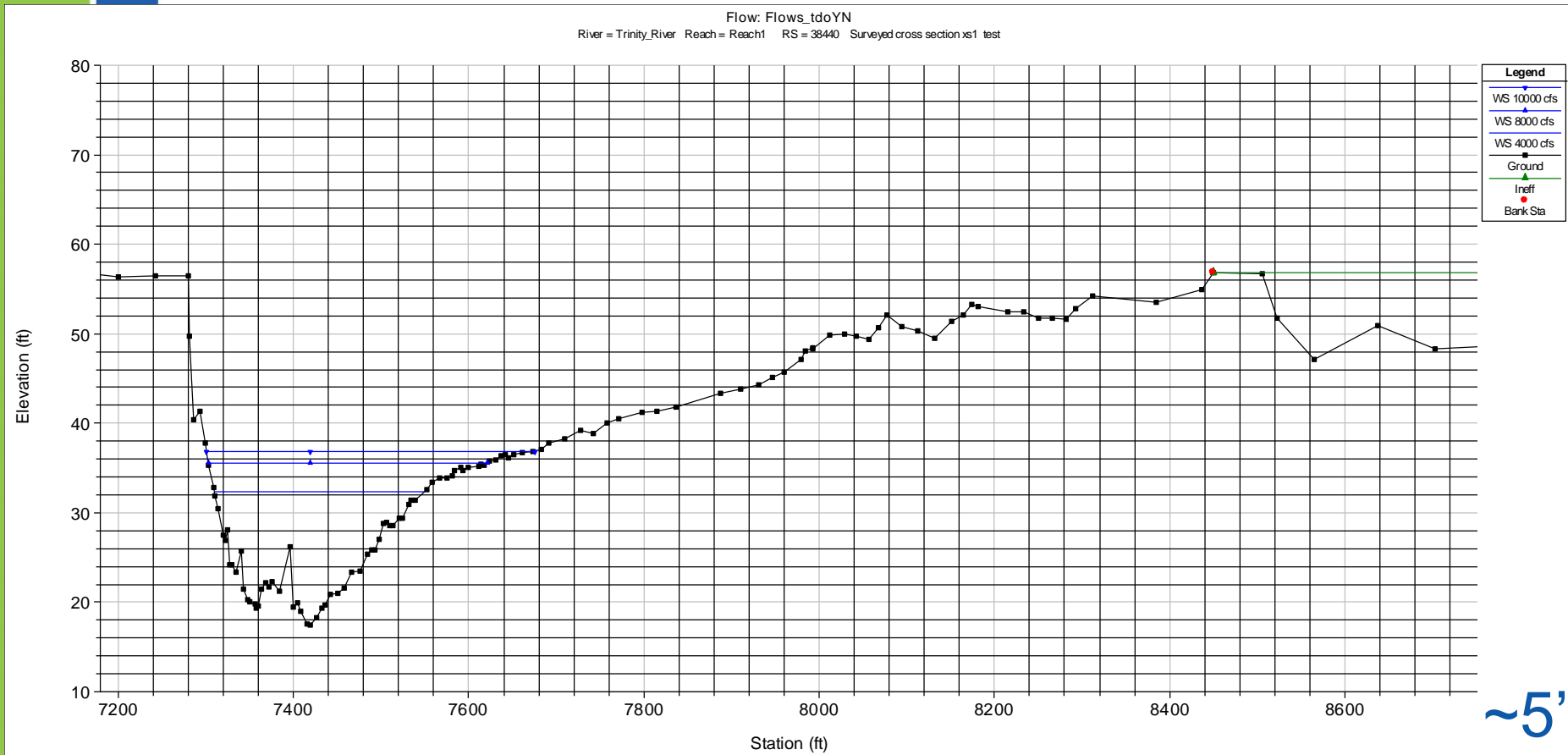
USGS Gage - 08066500 – Trinity River at Romayor, TX



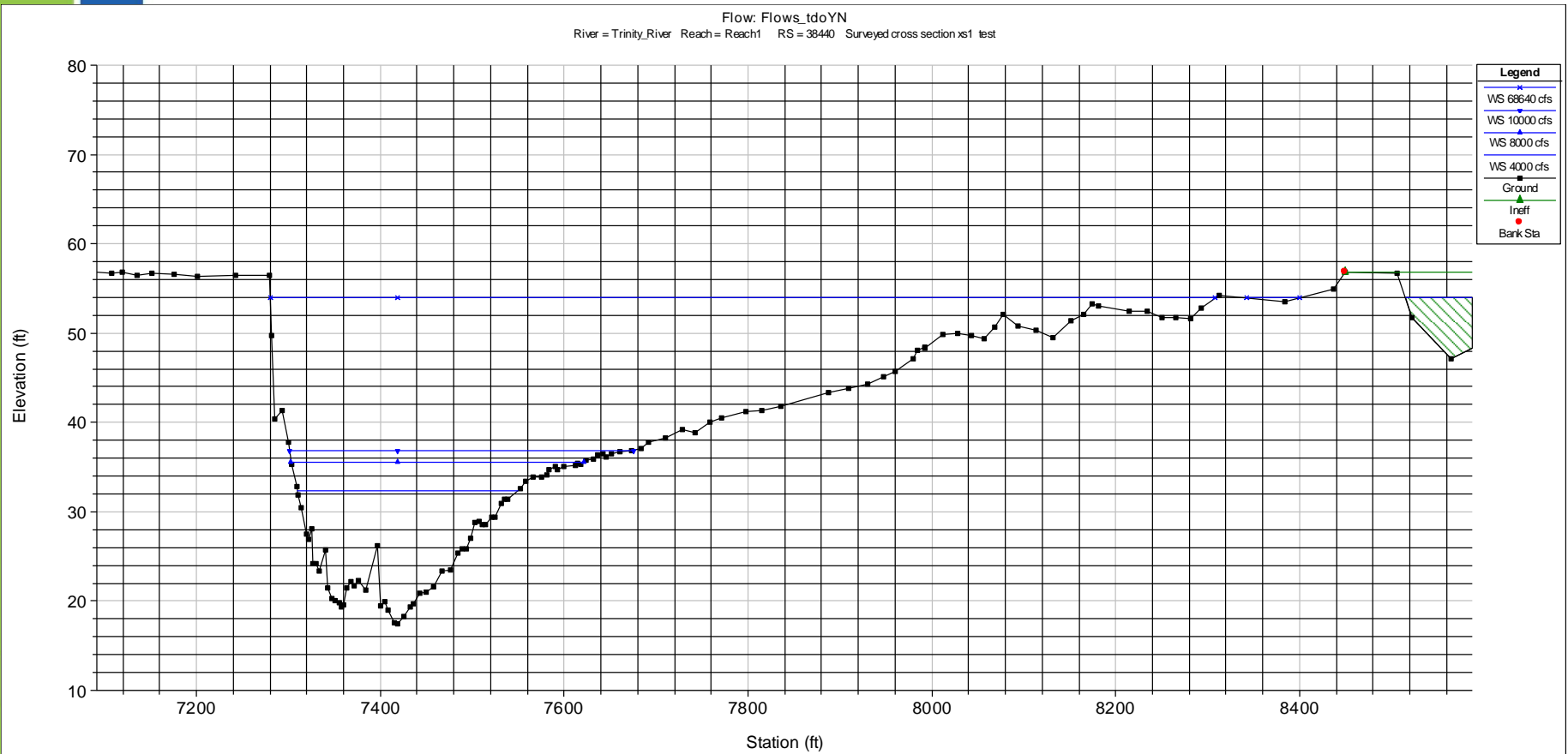
080075 – Cross-section 1 Changes



080075 – Cross-section 1



080075 – Cross-section 1



~17' between 10,000 cfs and 68,640 cfs

080075 – Cross-section 1 – 10,000 cfs



01.23.2015 13:06:57

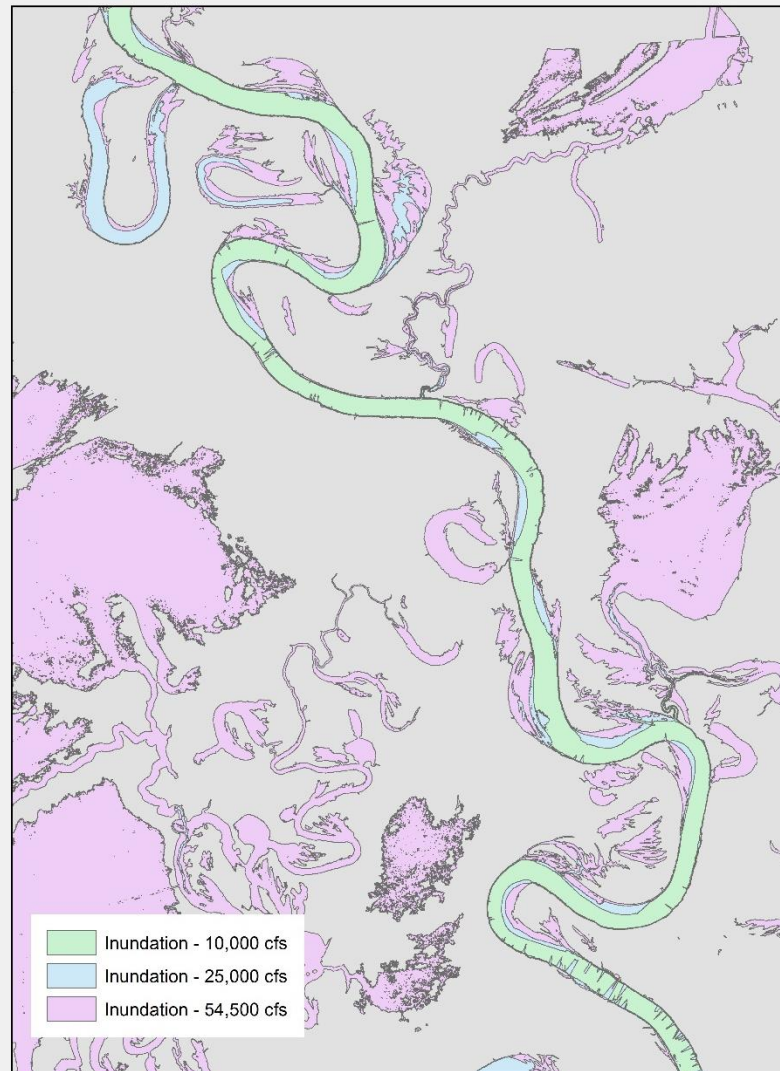
04

003°C 037°F 9

080075 – Riparian ~ 68,000 cfs



080075 – Riparian



080075 - Sediment

SB3 Flows	Sediment Size Mobilized at 080444_XS_4 (Riffle)
8,000 cfs (Winter)	Coarse Sand*
10,000 cfs (Spring)	Coarse Sand*
4,000 cfs (Summer/Fall)	Coarse Sand*

*Consistent with field samples (*it's all sand*).

Recommendations

- Repeat cross-sections should be completed at base flows at 080444, 080295, and 080075 to measure effects of flood flows on channel migration.
- Riparian work should be completed at 080295 and 080075.
- Install a site at the upstream SB3 measurement point.
- Linear surveys with RTK GPS should be completed throughout the segments that contain the SB3 sites to determine if there are areas where SB3 flows connect with floodplain/backwater habitat. (Build from previous linear surveys)
- Coordination with other basin efforts working to validate SB3 standards.
- Incorporate TIFP data (habitat, fish, and benthics) into the analysis or SB3 standards.
- New LiDAR should be flown where existing DEM data is suspect

Special Thanks To:

- TSJBBASC for funding this project
- Field Crew, especially Mike Vielleux and Nathan Brock from TWDB



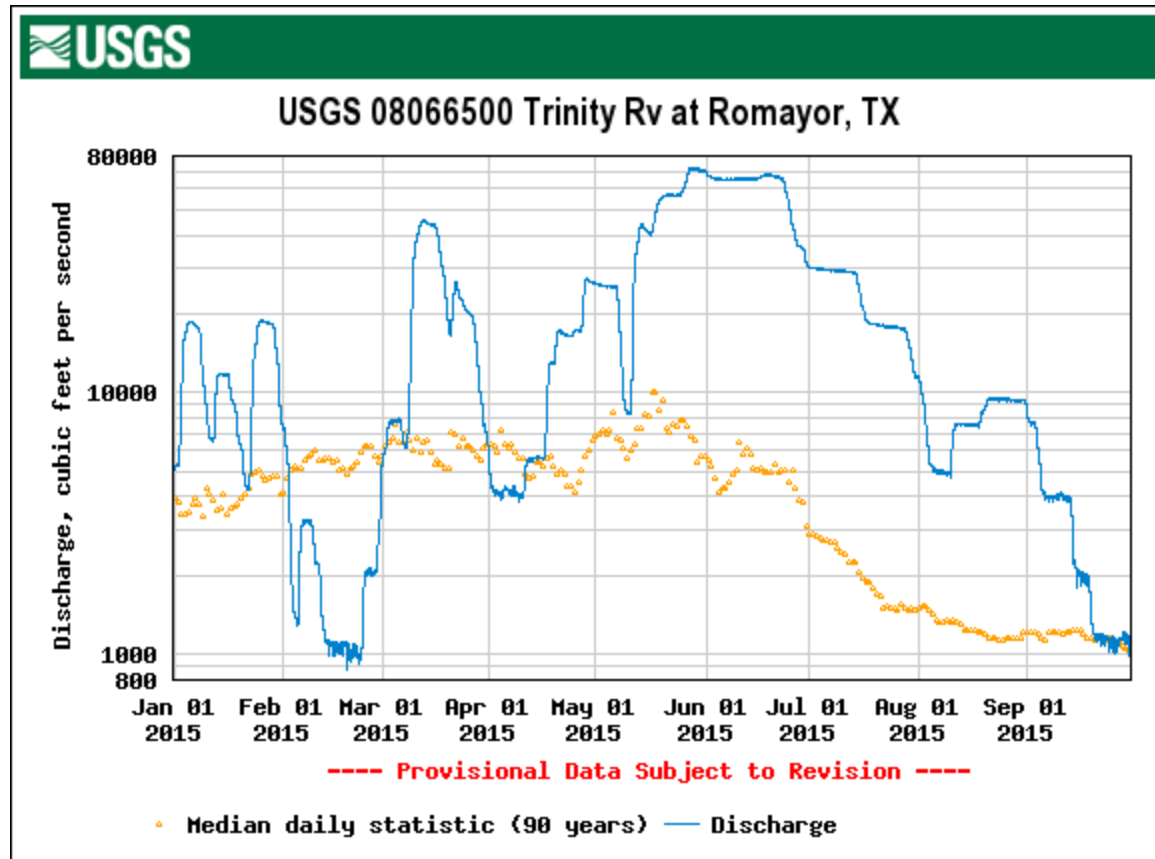
Questions?



References Listed in Report



Task 2 – Data Collection



Task 2 – Data Collection

